Appl. No. 10/602,556   <u>PATENT</u>
Amdt. dated December 9, 2003
Second Preliminary Amendment

Amendments to the Claims:

Claims 1-20 have been canceled without prejudice to their patentability and new claims 21-40 have been added. This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1   1. - 20. (Canceled)

1   21.   (New) A computer-implemented method of generating a graphical warp
2   through transformation of an undeformed model to a deformed model, the method comprising:
3   receiving information speeifuying the undeformed model;
4   receiving a set of feature specifications, each feature specification comprising a
5   source feature and a target feature;
6   receiving a set of transformations for mapping the source feature to the target
7   feature in each feature specification in the set of feature specifications;
8   receiving a set of strength fields defined over the undeformed model for scaling
9   the magnitude of transformations in the set of transformations to generate a set of scaled
10   transformations;
11   receiving a set of weighting fields defined over the undeformed model for
12   determining the relative influence of the set of scaled transformations; and
13   generating the deformed model by applying the set of transformations, the set of
14   strength fields, and the set of weighting fields to the undeformed model.

1   22.   (New) The method of claim 21 wherein the set of feature specifications
2   comprises a first feature specification comprising a source feature identifying a source position
3   of a continuous feature and a target feature identifying a target position of the continuous feature.

1   23.   (New) The method of claim 21 wherein the set of feature specifications
2   comprises a first feature specification comprising a source feature identifying a source position
3   of a discrete feature and a target feature identifying a target position of the discrete feature.

1   24.   (New) The method of claim 21 wherein the set of feature specifications
2   comprises a first feature specification comprising a source feature identifying a source position
3   of a feature point and a target feature identifying a target position of the feature point.

1   25.   (New) The method of claim 21 wherein the set of feature specifications
2   comprises a first feature specification comprising a source feature identifying a source coordinate
3   frame and a target feature identifying a target coordinate frame.

1   26.   (New) The method of claim 21 wherein the set of feature specifications
2   comprises a first feature specification comprising a source feature identifying a source curve and
3   a target feature identifying a target curve.

1   27.   (New) The method of claim 21 wherein the set of feature specifications
2   comprises a first feature specification comprising a source feature identifying a source surface
3   and a target feature identifying a target surface.

1   28.   (New) The method of claim 21 wherein the set of feature specifications
2   comprises a first feature specification comprising a source continuous feature and a target
3   continuous feature, and a second feature specification comprising a source discrete feature and a
4   target discrete feature.

1   29.   (New) The method of claim 21 wherein generating the deformed model
2   comprises:
3   computing a sum of the set of scaled transformations weighted by the set of
4   weighting fields, for deforming the undeformed model to generate the deformed model.

1   30.   (New) A computer-implemented method of generating a graphical warp,
2   the method comprising:
3   receiving information specifying an undeformed model;
4   receiving a parameter set specifying a warp;

5   determining, based upon the parameter set, a set of transformations, a set of

6 strength fields, and a set of weighting fields; and

7   determining a deformation function based upon the set of transformations, the set

8 of strength fields, and the set of weighting fields; and

9   applying the deformation function to the undeformed model to generate a

10 deformed model.

1   31.   (New) The method of claim 30 wherein:

2   the set of transformations comprises parameterized transformations;

3   the determining comprises applying a sampling function to the set of

4 parameterized transformations, the set of strength fields, and the set of weighting fields to

5 generate a set of discretized transformations, a set of sampled strength fields, and a set of

6 sampled weighting fields; and

7   determining the deformation function comprises computing the deformation

8 function using the set of discretized transformations, the set of sampled strength fields, and the

9 set of sampled weighting fields.

1   32.   (New) A computer program product stored on a computer-readable

2 medium for generating a graphical warp through transformation of an undeformed model to a

3 deformed model, the computer program product comprising:

4   code for receiving said undeformed model and a set of feature specifications each

5 of said set of feature specifications comprising a source feature, a target feature, and related

6 deformation parameters;

7   code for receiving a set of transformations corresponding to said set of feature

8 specifications and for mapping said source feature to said target feature in each of said set of

9 feature specifications;

10   code for receiving a set of strength fields corresponding to said set of feature

11 specifications and defined over said undeformed model for scaling the magnitude of each of said

12 set of transformations, establishing a set of scaled transformations;

13   code for receiving a set of weighting fields corresponding to said set of feature

14 specifications and defined over said undeformed model for determining the relative influence of

15 said set of scaled transformations; and

16   code for computing a sum of said set of scaled transformations weighted by said

17 set of weighting fields, for deforming said undeformed model to generate said deformed model.

1   33.   (New) The computer program product of claim 32 wherein at least one of

2 said set of feature specifications is continuous and has corresponding parameterized strength

3 field, transformation, and weighting field, the computer program product further comprising:

4   code for receiving a sampling function for discretizing said parameterized

5 transformation and sampling said strength field and said weighting field;

6   code for computing a discretized transformation, a sampled strength field, and a

7 sampled weighting field with said sampling function; and wherein said step of computing a sum

8 of said set of scaled transformations employs said discretized transformation, said sampled

9 strength field, and said sampled weighting field.

1   34.   (New) A computer program product stored on a computer-readable

2 medium for generating a graphical warp through transformation of an undeformed model to a

3 deformed model, the computer program product comprising:

4   code for receiving information specifying the undeformed model;

5   code for receiving a set of feature specifications, each feature specification

6 comprising a source feature and a target feature;

7   code for receiving a set of transformations for mapping the source feature to the

8 target feature in each feature specification in the set of feature specifications;

9   code for receiving a set of strength fields defined over the undeformed model for

10 scaling the magnitude of transformations in the set of transformations to generate a set of scaled

11 transformations;

12   code for receiving a set of weighting fields defined over the undeformed model

13 for determining the relative influence of the set of scaled transformations; and

14   code for generating the deformed model by applying the set of transformations,

15   the set of strength fields, and the set of weighting fields to the undeformed model.

1   35.   (New) The computer program product of claim 34 wherein the set of

2   feature specifications comprises a first feature specification comprising a source feature

3   identifying a source position of a continuous feature and a target feature identifying a target

4   position of the continuous feature.

1   36.   (New) The computer program product of claim 34 wherein the set of

2   feature specifications comprises a first feature specification comprising a source feature

3   identifying a source position of a discrete feature and a target feature identifying a target position

4   of the discrete feature.

1   37.   (New) A computer program product stored on a computer-readable

2   medium for generating a graphical warp, the computer program product comprising:

3   code for receiving information specifying an undeformed model;

4   code for receiving a parameter set specifying a warp;

5   code for determining, based upon the parameter set, a set of transformations, a set

6   of strength fields, and a set of weighting fields; and

7   code for determining a deformation function based upon the set of

8   transformations, the set of strength fields, and the set of weighting fields; and

9   code for applying the deformation function to the undeformed model to generate a

10   deformed model.

1   38.   (New) The computer program product of claim 37 wherein:

2   the set of transformations comprises parameterized transformations;

3   the code for determining comprises code for applying a sampling function to the

4   set of parameterized transformations, the set of strength fields, and the set of weighting fields to

5   generate a set of discretized transformations, a set of sampled strength fields, and a set of

6   sampled weighting fields; and

7   the code for determining the deformation function comprises code for computing

8   the deformation function using the set of discretized transformations, the set of sampled strength

9   fields, and the set of sampled weighting fields.

1   39.   (New) A system for generating a graphical warp through transformation of

2   an undeformed model to a deformed model, the system comprising:

3   a processor; and

4   a memory coupled to the processor, the memory configured to store a plurality of

5   instructions executable by the processor, the plurality of instructions comprising:

6   instructions for receiving information specifying the undeformed model;

7   instructions for receiving a set of feature specifications, each feature

8   specification comprising a source feature and a target feature;

9   instructions for receiving a set of transformations for mapping the source

10   feature to the target feature in each feature specification in the set of feature specifications;

11   instructions for receiving a set of strength fields defined over the

12   undeformed model for scaling the magnitude of transformations in the set of transformations to

13   generate a set of scaled transformations;

14   instructions for receiving a set of weighting fields defined over the

15   undeformed model for determining the relative influence of the set of scaled transformations;

16   and

17   instructions for generating the deformed model by applying the set of

18   transformations, the set of strength fields, and the set of weighting fields to the undeformed

19   model.

1   40.   (New) A system for generating a graphical warp, the system comprising:

2   a processor; and

3   a memory coupled to the processor, the memory configured to store a plurality of

4   instructions executable by the processor, the plurality of instructions comprising:

5   instructions for receiving information specifying an undeformed model;

6   instructions for receiving a parameter set specifying a warp;

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7   instructions for determining, based upon the parameter set, a set of

8   transformations, a set of strength fields, and a set of weighting fields; and

9   instructions for determining a deformation function based upon the set of

10   transformations, the set of strength fields, and the set of weighting fields; and

11   instructions for applying the deformation function to the undeformed

12   model to generate a deformed model.